DOCUMENT RESUME

ED 024 540 24 RE 001 486

By- Koenke, Karl

The Effects of a Content-Relevant Picture on the Comprehension of the Main Idea of a Paragraph. Report From the Reading Project.

Wisconsin Univ., Madison. Research and Development Center for Cognitive Learning.
Spons Agency- Office of Education (DHEW), Washington, D.C. Bureau of Research.
Report No- WRDCCL-TR-56
Bureau No- BR-5-0216
Pub Date Jun 68
Contract- OEC-5-10-154
Note- 41p.
EDRS Price MF-$0.25 HC-$2.15
Descriptors- Grade 3, Grade 6, Pictorial Stimuli, *Readability, *Reading Comprehension, *Reading Instruction, *Reading Research, *Visual Learning, Visual Perception

The importance of content-relevant pictures in the comprehension of the main idea of a paragraph was investigated. Various reading conditions were constructed which contained a paragraph, a picture, or both, each with three types of instructions. In addition, the effects of paragraph readability, student grade placement (grade 3 and 6), and sex were examined. An analysis of variance of the main idea responses to the pictures showed that in general there were no significant differences between boys and girls or between third and sixth graders. Responses to one picture were better than responses to the other two, but only for sixth-grade subjects. The analysis of variance of ratings of the responses to the paragraphs with/without pictures and directions did not affect the adequacy of main idea responses. Although both readability and grade effects were significant, post hoc analyses showed that reading basic paragraphs led to significantly better main idea responses only among the sixth graders and that the significantly higher boys' mean accounted for the difference. (Author/WB)

EDO 245+

BR-5-0216
PA-24

TECHNICAL REPORT NO. 56

THE EFFECTS OF A CONTENT-RELEVANT PICTURE ON THE COMPREHENSION OF THE MAIN IDEA OF A PARAGRAPH

REPORT FROM THE READING PROJECT

WISCONSIN RESEARCH AND DEVELOPMENT

CENTER FOR
COGNITIVE LEARNING

THE UNIVERSITY OF WISCONSIN
Madison, Wisconsin

U.S. Office of Education
Center No. C-03
Contract OE 5-10-154

ERIC

Technical Report No. 56

THE EFFECTS OF A CONTENT-RELEVANT PICTURE ON THE COMPREHENSION OF THE MAIN IDEA OF A PARAGRAPH

By Karl Koenke

Report from the Reading Project
Wayne Otto and Karl Koenke, Principal Investigators

Wisconsin Research and Development
Center for Cognitive Learning
and the
Laboratory for Research in Basic Skills
The University of Wisconsin
Madison, Wisconsin

June 1968

U. S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

The research reported herein was performed pursuant to a contract with the United States Office of Education, Department of Health, Education, and Welfare, under the provisions of the Cooperative Research Program.

Center No. C-03 / Contract OE 5-10-154

PREFACE

This Technical Report is a product of the reading project within Program 2, Processes and Programs of Instruction, of the Wisconsin R & D Center for Cognitive Learning. The overall purpose of the program is to improve educational practice through the application of knowledge to instructional problems within disciplines, such as reading.

The study reported in this document was designed to gain information about the importance of content-relevant pictures to the comprehension of the main idea in a paragraph to be read. Various reading conditions were constructed which contained a paragraph, a picture, or both, each with three types of instructions. In addition, the effects of readability of the paragraphs, grade placement of the students (third and sixth grades), and sex were examined.

This report illustrates process related research and contributes to the understanding of cognitive learning within instructional systems.

T. A. Romberg
Director of Program 2

CONTENTS

		Page
	List of Tables and Figures	vii
	Abstract	ix
I	Problem	1
II	Method	9
III	Results and Discussion	17
IV	Summary, Limitations and Conclusions, and Implications	23
	Appendix A: Pretask	27
	Appendix B: Directions	28
	Appendix C: Materials	29
	Appendix D: Response Sheet	32
	References	33

LIST OF TABLES AND FIGURES

Table		Page
1	Readability Data for All Paragraphs According to Main Idea	12
2	The Number of Phrases and Clauses in Each Sentence of the Paragraphs, Grades 1–6	13
3	Sentence Location of Phrases and Clauses in Paragraphs 1, 3, and 6 of Main Ideas A, B, and C	13
4	Frequency of Main Idea Ratings for Each Picture	17
5	Analysis of Variance of the Picture Response Ratings	17
6	Mean Main Idea Response Ratings for Subjects Viewing Pictures	18
7	Ordered Means and All Pair-Wise Gaps: Pictures Main Effect	18
8	Mean Main Idea Ratings: Pictures x Grade	18
9	Ordered Means and All Pair-Wise Gaps: Picture x Grade	18
10	Mean Main Idea Scores of 192 Subjects Reading Paragraphs	19
11	Analysis of Variance of the Mean Main Idea Response Ratings	19
12	Mean Main Idea Ratings: Grade x Sex	20
13	Ordered Means and All Pair-Wise Gaps: Grade x Sex Interaction	20
14	Ordered Means and All Pair-Wise Gaps: Readability Levels x Grades Interaction	20

Figure		
1	The Cognitive Functions Used in Attaining the Concepts in a Main Idea	11
2	The Second Main Idea Scale	14
3	The Third Main Idea Scale	14

Figure		Page
4	The Fourth Main Idea Scale	15
5	Mean Main Idea Ratings Obtained from Three Pictures	18
6	Mean Main Idea Scores of Boys and Girls at Grades 3 and 6	20
7	Mean Main Idea Scores for Grades 3 and 6 with Paragraphs at Two Readability Levels	21
8	The Fifth Main Idea Scale	26

ABSTRACT

The study was designed to investigate the effects of content-relevant pictures upon main idea responses of third- and sixth-grade students. There were two general questions: (1) To what extent can pictures carry a main idea message? (2) To what extent can content-relevant pictures reinforce or aid in the comprehension of the main idea of a paragraph?

Subjects in the five conditions were asked to either (1) view three pictures, (2) read three paragraphs, (3) read three paragraphs with pictures, (4) read three paragraphs with pictures with directions to attend to the picture, or (5) read three paragraphs with pictures with an explanation of the relationship of the picture to the paragraph. One half of the subjects in the treatments using written material saw the basic paragraph, while the other half saw materials judged to be their attained grade in readability.

The tabulation of responses to the pictures showed that the responses generally received low ratings on a seven-point main idea scale. An analysis of variance of the main idea responses to the pictures showed that in general there were no significant differences between the responses of boys and girls or third and sixth graders. Responses to one picture were better than responses to the other two, but only for sixth-grade subjects. The analysis of variance of ratings of the responses to the paragraphs with/without pictures and directions showed that the addition of the pictures and directions did not affect the adequacy of the main idea responses. Although both Readability and Grade effects were significant, post hoc analyses showed that reading basic paragraphs led to significantly better main idea responses only among the sixth graders and that the significantly higher boys' mean accounted for the difference.

I
THE PROBLEM

Past investigations of the effect of pictures upon reading comprehension have typically been justified by the fact that educators did not know the effects of the large number of pictures in school books upon children's reading comprehension. This justification for the investigation of the picture-reading comprehension relationship is still valid, for reviewers (Spaulding, 1955; Vernon, 1954; and Weintraub, 1966a) of studies of this relationship have agreed that the dubious quality of the studies and their conflicting results make it impossible to base conclusions about the relationship between pictures and reading comprehension upon research. The same writers have made two suggestions for further research concerning the effects of pictures upon reading comprehension. (1) The relationship between the pictures and the written material should be described. (2) The relationship of pictures to specific types of comprehension should be considered.

Therefore, in the present study of the effects of pictures upon reading comprehension, the pictures are related to the written materials in that an artist drew the pictures to illustrate the same main idea message carried by the paragraphs, and the pictures are related to a specific type of comprehension in that only one type of main idea message was considered in the writing of the paragraphs, the drawing of the pictures, and the comprehension testing. Within these limitations and because empirical data were not available, answers to two questions were sought. (1) To what extent can pictures carry a main idea message? (2) To what extent can content-relevant pictures reinforce or aid in the comprehension of the main idea of a paragraph?

REVIEW OF THE RELATED RESEARCH

The work of earlier researchers which serves as the rationale for the present study of the effects of content-relevant pictures on the comprehension of the main idea of a paragraph is that which was focused on the picture-reading comprehension relationship. The intensive review of this research comprises two parts: (1) studies of the effects of pictures on the reading comprehension of elementary school pupils, and (2) studies of the effects of pictures on the reading comprehension of secondary school pupils.

Studies In The Elementary School

The most frequently cited investigations of the effects of pictures upon reading comprehension was done by Miller (1938). The purpose of his study was to determine whether children in Grades 1–3 who read a basal set of primary readers with the accompanying illustrations scored higher on a comprehension test than children who read the same material without the pictures. Six hundred subjects from fifteen classrooms in three Springfield, Illinois, elementary schools were involved. Half of the subjects within each grade level read their basal reader with the pictures covered while the other half had textbooks as they came from the publisher. Each classroom contained both experimental groups matched on reading test scores. Teaching methods were not described, but assurance was given that the groups received identical treatment. The comprehension measure was the difference between pre- and posttest scores over individual stories and the difference between posttest scores across grades and treatments. Gains in gross reading ability were measured by alternate forms of a standardized achievement test given at the beginning and the close of the semester.

The reading comprehension tests for the individual stories seemed unique, and one wonders why Miller chose to operationalize reading comprehension in the following manner:

> Children were required to choose, from a group of words, a word spoken by the teacher;

to select a phrase from two phrases when one was spoken by the teacher; to cross out an extraneous word from a group of three words; to complete sentences after reading a paragraph; and to put in proper sequence the happening recorded in a paragraph to be read [Miller, 1938, p. 678].

The following factors may have confounded Miller's results: (1) the relationship of picture to questions was not considered; (2) the results of the comparison across grades on individual stories was confounded since the story content, the pictures, the readability levels, and the questions on the tests varied while the second measure, the standardized test, might not have been sensitive enough for the within-semester comparison of reading achievement which Miller wanted; (3) the experimental groups shared teacher, space, and time; and one wonders how many subjects actually did not see most or all of the pictures or hear another subject's response to a teacher's question concerning a relevant portion of the content of a picture. Since the groups were matched on reading ability, it is possible that both groups were present in each reading circle or group and were taught at the same time. Considering these problems, Miller's results are not surprising; no significant differences were found between the picture and the nonpicture groups on the standardized reading achievement tests or on the comprehension tests covering the individual stories.

The only other investigator to concern himself with pictures and written materials which appear in a basal series was Weintraub (1960), who limited his investigation to the Sheldon basal series and second-grade subjects. He measured comprehension with a ten question multiple-choice test on each of three different stories in the book. Weintraub stated that these tests measured comprehension of the main points of the story. No further definition of the comprehension measure was given, but inspection of the questions showed that they dealt with the movements, descriptions, and reasons for action of the characters in the stories.

Weintraub reported that the subjects reading text alone scored significantly higher on his multiple-choice tests, but a check by the present investigator revealed a subtraction error between means compared in the Duncan Range Test. Actually, the means of the groups reading text and text with pictures were not significantly different (p. 44). Furthermore, although Weintraub concluded that poor readers read best without pictures while good readers were not affected by presentation differences (excluding pictures alone), a check of the actual statistics (p. 53) showed that the Duncan Range Test did not show a significant difference between treatments—text alone and picture with text—for poor readers. Weintraub's conclusion was correct on the basis of a gross comparison of means; but the difference, according to his own choice of a post hoc test, was not significant.

It should be noted that each story was introduced, but the form was not described in detail and Weintraub states that the introductions varied (p. 32). He also listed four limitations of his study: (1) the texts were from one publisher; (2) the pictures were taken as they appeared, and, therefore, no controls were placed upon the picture function; (3) the population was upper-middle class only; and (4) there was no demonstrated or theoretical relationship between the questions and specific aspects of reading comprehension.

Two studies of the picture-reading comprehension relationship used pictorial and written material which approximated basal readers, but there the similarity ended (Strang, 1941; Halbert, 1943). Halbert's study was unique in that the sample of 234 subjects was selected mostly from one-room schools in Jackson County, Kentucky, which was 100% rural according to the U. S. census of 1941. In fact, Halbert mentioned that the largest urban center had a population of 175. The subjects ranged in age from 8 1/2 to 12, but their grade placement could not be considered as typical because reading achievement scores reported showed the sample to be generally below the national norm.

The pictures and reading materials in the Halbert study were created for a project in which an attempt was made to disseminate dietary information through supplementary basal readers. Halbert described the written materials as having a reading level, a style, and a vocabulary typical of basal readers of the period. No specific material or picture controls were presented, except that the children in the pictures were to be dressed as the readers were accustomed to dress. The pictures were rather general, e.g., a boy looking at the rain through a window, a boy placing a worm on a fish hook for a girl. Halbert states that the subjects were not told to view the pictures or to consider their content. The subjects were tested individually and an informal warmup task consisted of asking the subject his name and other personal information. Comprehension was measured by the number of ideas stated by the subject after reading the material orally. The choice of measure was based upon the inability of the subjects to communicate well in an essay situation and the investigator's acceptance of a study which showed multiple-choice questions were troublesome. The three conditions which

were tested were the usual picture and the text, the text alone, and the picture alone. The responses were classified as relevant or irrelevant. Operationally, the former were sentences containing a summary or a description of a detail, an event, or a principle. The latter were statements not related to the written material or the illustrator's stated topic for the picture.

The statistics were descriptive and tests of significance were not performed on the data. No provisions were made for consideration of possible interactions of readability of text, ability of the child, sex, and treatment.

Halbert noted in discussing her results that the three different pictures evoked different numbers of relevant responses, and that the highest number of relevant responses evoked by a picture and text combination included the picture which evoked the greatest number of relevant ideas. No comment was made concerning the text. The picture and text formats were associated with the greatest number of relevant responses. Pictures alone evoked a greater number of responses than text alone, but most were irrelevant. Good and average readers gave fewer total responses than poor readers, but the good and average readers gave more relevant responses than the poor readers.

Halbert concluded, "To the extent that memory for ideas is a measure of comprehension, to that extent pictures contribute to the comprehension of reading materials [p. 57]." It might be added that this observation was probably accurate within the limitations of sample, materials, and use of statistical procedures.

Whereas Halbert (1943) used a rather unique population, subject matter, and comprehension measure, Strang's study (1941) of gains and losses in concepts as indicated by pupil reading scores after the addition of illustrations to reading material was not marked by these unique features. Strang described his population as the entire fourth, fifth, and sixth grades of a single school in Philadelphia. Furthermore, the achievement of the subjects and the social status of the families were above the norm. The materials were basal reader-like in appearance, and, although no controls were defined, the materials had been submitted to several editors and authors of children's literature for criticism and general validation. Style, length, and content varied from passage to passage. Each passage was followed by four multiple-choice questions. The first questions dealt with the main idea as a title to the story, while the other three asked for identification of specific facts. The pictures were 2" x 3" black and white photographs or drawings mounted in the upper right hand corner of the page. The relevance of picture to passage or question was not stated by Strang. Furthermore, inspection of the material by the present investigator did not reveal a pattern or relationship.

The subjects read the unillustrated stories first, but the grade levels were split with half reading stories A, B, and C without pictures and the other half reading stories D, E, and F without pictures. Several weeks later the groups read the three stories they had not read previously, this time with pictures. The directions consisted of sample exercises.

The gains and losses were measured relative to the individual's score on the unillustrated material. Although means for various groups were given and compared, tests of statistical probability were not used. The individual's score was a summation of the scores of the three stories under each condition. No hypotheses were stated, and the results were difficult to interpret, but Strang did conclude that there were more gains than losses from the unillustrated to the illustrated reading conditions at all grade levels. The multiple-choice tests were presumed to be measures of concepts, but there was not a stated definition of the term "concept." Operationally, Strang measured main idea and specific fact in a multiple-choice test without reliability estimates. The subjects represented a special though not infrequently described type of population, but the picture-text-test relationship was not explained. There also appeared to be no way to separate the results from practice effect, since the illustrated condition was always the second in order of presentation.

Brief reports of three studies by Goodykoontz (1936) revealed that she did not seem concerned with establishing a relationship between the materials her subjects read and classroom materials, as was the case with the previous investigators. In all three studies the subjects read a twelve page booklet about cork, but no further information about the materials was given. In the first study she tested 294 subjects in Grades 6–8 with thirteen questions about the written text and thirteen questions about the pictures. No directions were given to the subjects to look at the pictures accompanying the written text. Since Goodykoontz did not have separate groups reading the material with and without pictures, she asked the subjects to tell her whether they had looked at the pictures during the reading. She found that 6 percent of the subjects had not looked at the pictures, 25 percent had looked at the pictures for fun after reading all the text, and 50 percent had looked at the pictures as they came to them. The results of the testing showed no differences between groups on the questions concerning the

text, but of the thirteen questions concerning the pictures the subjects looking at the pictures had a median score which was two successfully answered questions better than those who did not view the pictures.

In the second study in the series Goodykoontz directed "nearly ninety" sixth-grade students to answer thirteen questions concerning the pictures in the booklet about cork while looking at the pictures. The questions were described as "main point," but no example was given. Since the group had a median of eight correct, Goodykoontz concluded that the pictures did add extra information which the students can discover.

In the last study by Goodykoontz (1936) the same "nearly ninety" subjects read a section of the booklet about cork which they had not seen, then looked at two pictures which they had not seen and finally listed all the information which the pictures added to what they learned from the text. Goodykoontz found that the subjects' median number of bits of information seen which related to the previously read text was two per picture. The writing of this result left the present investigator with the feeling that Goodykoontz was disappointed with the few bits of information seen in each picture.

Since Goodykoontz was one of the first to investigate the picture-reading comprehension relationship and the reports were brief, the following comments concerning methodology should be viewed in that light. Goodykoontz did not describe her sample, question format, and specific aspect of comprehension tested or give the exact sample size. Furthermore, the characteristics of the material and the pictures were not given, and she did not use statistical probability in the first of the studies where it would have facilitated interpretation of the results.

Lewernz (1929), like Goodykoontz (1936), used pictures which carried more information than the written text and tested for this extra information. Lewernz compared the reading achievement scores of a group that read and saw pictures with those of a group that only read the material. The subjects were 359 eighth-grade students from five Los Angeles junior high schools. The materials were eight still photographs from a movie and accompanying historical background about Columbus. One group was directed to study the pictures because the test was based upon them, but the directions to the other group were not mentioned. Example questions from the true-false test concerned the color of a wall, the construction of a chair, and the type of jewelry worn by men. The percentage difference favored the group who saw the pictures and the material. This was expected because, as Lewernz stated, the questions were based upon the content of the pictures.

The group that saw the pictures obtained scores averaging 15% higher than those not viewing pictures, but the number of questions, the use of probability, the reliability and the content of the test, and the difficulty of the material were not mentioned. It would seem that what Lewernz actually found was that if eighth-grade students were asked questions about details of a picture that they had not seen, they could not answer the questions with as great a degree of success as those students who saw the picture.

Studies In Secondary Schools

While investigations of Miller (1938), Weintraub (1960), Halbert (1943), Strang (1941), Goodykoontz (1936), and Lewernz (1929) were limited to elementary school populations, studies by Burdick (1959), Kambly (1943), Vandermeer (1950), and Davis, Hicks, and Bowers (1966) extended the investigation of the effects of pictures on reading comprehension to the high school level.

Burdick (1959) investigated the relative abilities of 313 subjects in Grades 7–12 to read cross-section and perspective cutaway drawings that might appear in science textbooks. In contrast to Goodykoontz and Lewernz, Burdick used the pictures to reinforce the information in the written text rather than to carry more information. He found no significant differences between mean comprehension scores of the groups that read with and without illustrations, but there was a significant grade effect in the analysis of variance. Burdick did not present a table of means or use a post hoc test, so the basis for his conclusion that ability to read material with and without cross-sections and perspective cutaway drawings is learned and increases through grade levels cannot be checked. Since the same written material was used at all six grade levels, it might not approximate a typical reading task. While the pictures used by Burdick were described as representing those found in a list of selected textbooks, the characteristics of the written portion were not given.

Vandermeer (1950) also had both elementary and secondary school students involved in his study, but in contrast to Burdick (1959) only two grade levels— eighth and eleventh— were used. Vandermeer found no significant differences within each grade level between a group that saw a commercially produced historical filmstrip and heard a monologue and a group that read the monologue silently while the teacher read it orally. While the subjects were randomly assigned to treatments and one teacher

taught both methods, the possibility of an interaction between grade and instructional method was not considered and the relationship of the multiple-choice test to the monologue and the pictured information was not described. Since neither group actually read textbook material or read silently without the benefit of a teacher's oral presentation of the same material and the relationship between the effects of pictures in a filmstrip and pictures in a text upon comprehension is unknown, it is not possible to generalize to the effects of pictures in texts upon reading comprehension of historical material.

In what may be the first published study of its kind, Kambly (1943) compared the mean gain scores from pre- and posttests on a general science unit of ninth-grade students who read their science material either with or without the textbook pictures. Each group comprised three classrooms with both groups receiving the same demonstrations. The test of group means showed a difference favoring the subjects reading the text accompanied by pictures. In the same article Kambly reported results favoring the text with picture group when the materials and test concerned biology. In both cases the relationship of the textbook pictures to the text was not given and the population, test content, and text format were not described.

In the most recent American study of the effects of illustrations on reading comprehension, Davis, Hicks, and Bowers (1966) investigated the comprehension of chronological relationships as a function of the addition of time lines to a historical passage. Although time lines are graphs, not pictures, this study is included because a single element of comprehension was studied. The sample consisted of 81 eleventh- and twelfth-grade students from several world history classes in the high school attached to a North Carolina teacher-training institution. Twenty-seven subjects were randomly assigned to read a specially constructed 700 word passage about the acquisition of the Panama Canal with a correct time line, without a time line, and with an incorrectly drawn time line. Davis, Hicks, and Bowers characterized the time line as a reinforcer because it presented the same information as the written text and was therefore a repetition of information for the good reader and a source of information only for the poor reader. The subjects were told to read and study the narrative for ten minutes, but no mention was made of the time line in the directions. Comprehension of chronological relationships was measured by a twelve item multiple-choice and ordering test with a split-half reliability of .74. IQ measures were available and were incorporated in the design as an afterthought. The condition "correct-time-line" was significantly better than condition "no-time-line," but "incorrect-time-line" did not differ from either. As expected, the high IQ (120 plus) group was the most successful and no interaction was observed.

An assumption that students enrolled in a special high school are usually above average in scholastic aptitude seems to be borne out by the IQ scores Davis, Hicks, and Bowers used to delimit their three IQ classifications—under 109, 110–119, and 120 plus. It may be concluded then that the results are limited to an above average group, such as one may find in selected suburban areas.

In contrast to all the preceding investigations, Vernon (1953, 1954) reported a series of studies of the effects of pictures on the reading comprehension of English school children. Although Vernon placed many controls upon her investigations that were not found in the work previously reviewed in this section, a basic problem is that the population was English and in all cases part of the sample was older than eleven and a half, at which time the examination which segregates the college-bound from the terminal students is taken. Therefore, the similarity of Vernon's samples from several special types of schools to any U. S. population is unclear.

The first two studies reported by Vernon (1953) were exploratory in nature. The question asked in the first study was: "Do pictures help or hinder the acquisition of knowledge from the text?" The subjects were 14 boys and 21 girls, ages 16 to 18, in attendance at an English grammar school. The materials were two articles of 700–800 words. Article A dealt with the causes and cure of TB, while article B dealt with causes of illness in young children. There were two versions of each article: A_1 and B_1 were written in "popular" style and accompanied by photographs characterized as "striking" by Vernon; A_2 and B_2 were written "more objectively" and were accompanied by an unspecified number of graphs. Ten minutes were allowed for reading and study of the material. Each subject was first asked to recall orally what the article was about and then was asked to state what might be done to reduce the danger of TB or childhood illnesses. The scores for the oral reports were the number of "major points" recalled, the number of details recalled, and the coherence and consistency of the report which was graded A through D.

In the second of the two exploratory studies, Vernon investigated the effects of pictorial illustration on the amount remembered. The subjects were 24 boys and girls, ages 15 and 16, from a secondary modern school. The materials were versions A_1 and B_1 with and without pictures.

The task and the scoring were the same as in the first study.

The results of both studies were of the same nature. No significant differences were found in the percentage of major points or details recalled between material treatments. Also, the type of presentation did not affect the consistency and coherence of the responses. However, five major points in the text directly illustrated by pictures were remembered better than those same points unillustrated by pictures.

On the basis of the two preceding studies Vernon concluded, "...although the pictures may weight some part at the expense of others, their effect upon a coherent recall of the whole was neither favorable or unfavorable [p. 183]."

In a second series of experiments, Vernon (1954) emphasized the instructional aspects of the picture-text relationship. In these studies she used children with an age range of 10 to 13 years. The first set of materials consisted of two selections of 755 and 940 words dealing with collecting and printing of news and the passage of a ship into a harbor and its unloading. Each selection was read under two conditions: (1) with eight full-page pictures facing the text to which they related, and (2) with eight small black-and-white line drawings of some items mentioned in the text. After reading and studying the selection for ten minutes, the subject was asked six general questions "emphasizing the sequence of events." Vernon stated that where the text was difficult and the pictures were of help, they were not used. The second set of materials consisted of three passages pertaining to bridges, wheels, and furniture. The language was "simplified" and the length in all cases was 300 words. Each selection was presented orally and accompanied by (a) ten pictures viewed in sequence, (b) three or four simple outline drawings on a single card, or (c) four photographs on a single card. The experimenter who read the material either presented or pointed to the appropriate picture when related context was read. The task here was to recall as much as possible of a historical sequence of events or cause and effect. The boys did significantly better than the girls, and since the IQs were not significantly different, Vernon attributed the girls' lack of success to their lack of interest. There were no significant differences among the treatments of the material as measured by the comprehension test.

Vernon (1954) concluded on the basis of the preceding studies that "the pictorial illustrations in general had little effect upon the understanding and recall of verbal material [p. 177]."

SCOPE OF THE PROBLEM

The dubious quality and the conflicting results of previous investigations of the effects of pictures on reading comprehension have been noted here and in two earlier reviews (Vernon, 1954; Weintraub, 1966a). One of the reviewers (Weintraub, 1966a) also concluded on the basis of his observations that final statements concerning the picture-reading comprehension relationship could not be drawn from the existing research. This conclusion seems to be substantiated by the present investigator's summary of observations about the methods and the results of existing research: (1) The statistical procedures and methodology used in earlier investigations were less than adequate except for the studies of Vernon (1954) and Davis, Hicks, and Bowers (1966). (2) Atypical populations were sampled by Strang (1941), Halbert (1943), Vernon (1953, 1954), Weintraub (1960), and Davis, Hicks, and Bowers (1966). (3) The measure of comprehension was unique in the studies of Miller (1938) and Halbert (1943). (4) There was an inadequate description of population, comprehension measure, or materials in most of the studies. (5) The results and conclusions differ from study to study, even where some of the procedures were approximately the same. For example, Lewernz (1929) and Goodykoontz (1936) apparently used pictures which did not contain the same material as the written text, but Lewernz' results favored the picture with text and Goodykoontz' results showed no differences between text-and-pictures and text alone. Furthermore, Miller (1938), Strang (1941), Weintraub (1960) used materials which were of the basal reader type, but Miller found no differences between text-with-pictures and text, Strang found text-with-pictures superior, and Weintraub concluded in favor of text alone.

The reviewers of the studies of the effects of pictures upon reading comprehension (Vernon, 1954; Weintraub, 1966a) have also recommended meeting two conditions not present in most of the existing work. The recommendations were (1) to describe the relationship between the picture and the written material with which it is associated and (2) not to work with global comprehension measures, rather to deal with a specific aspect of comprehension and its relationship to pictures.

The investigator's concern for the recommendations of Vernon and Weintraub is shown in the two general questions which served as the foci of the study: (1) To what extent can pictures carry a main idea message? (2) To what extent can content-relevant pictures rein-

force or aid in the comprehension of the main idea of a paragraph?

The particular type of reading comprehension, reading for the main idea of a paragraph, was chosen as a focus of the present study for several reasons. (1) The "main idea" has not been operationally defined or considered separately in any of the existing studies, although Strang (1941), Halvert (1943), Vernon (1953), and Weintraub (1960), have either attempted to measure major points or included questions concerning titles and main thoughts in a total measure. (2) Tightly controlled materials which permit an operational definition of the main idea were available through the Laboratory for Research in Basic Skills, University of Wisconsin. (3) Authorities (Russell, 1961; Harris, 1961; Gray, 1960), a factor analysis by Davis (1944), and a survey by Broening (1941) have identified reading for the main idea as an important skill, a separate skill, and a commonly used skill.

Within the framework of the two major questions, the effects of direction to look at the picture, readability of the written materials, and sex and grade level of the subjects were also examined. The impact of direction to look at the picture when it did accompany the text was examined because Goodykoontz (1936) found that her subjects did not all habitually look at the pictures and Miller (1938) concluded that direction was necessary if learning from pictures was to take place. Readability formulae controls were placed on the written materials since this seemed the best way to provide for generalization and replication. This is in contrast to all previous work. In fact, only Weintraub (1960) and Strang (1941) have provided enough information about the written material to allow replication. The decision to have materials rated as first- and attained-grade readability levels read at both third and sixth grades was based on the lack of research upon the effects of level of reading difficulty on use of pictures as comprehension aids. Only two investigators have commented on this possible influence. (1) Vernon (1954) made informal observations of her subjects and concluded they did not use the pictures as aids when the material was difficult. (2) Weintraub (1960) found that 13 "poor" readers read equally well with and without pictures accompanying the text.

The sample composition was controlled as to the number of boys and girls because the conclusion of two recent reviews of sex differences in reading comprehension (Weintraub, 1966b; Davis and Slobodian, 1967) was that although girls are generally thought to be better readers, existing results are mixed and may depend on the specific measure or aspect of comprehension. Furthermore, Vernon (1953) and Lewernz (1929) found that boys make better use of pictures in some cases. Two grade levels, three and six, were chosen because only three studies of the picture-reading comprehension relationship have been found which deal with a primary grade population (Halbert, 1943; Miller, 1938; Weintraub, 1960) and only two studies have used a middle elementary school population (Goodykoontz, 1936; Strang, 1941). Grade 3 was chosen because (a) it represents a part of the primary grade population and (b) the skill of reading for a main idea is not generally considered an appropriate comprehension task for first and second graders. Grade 6 was chosen to represent the middle elementary grades because this is the last grade level at which many children receive formal instruction in reading, and knowledge of their success upon completing "formal reading instruction" might yield implications for instruction in the junior high school. Furthermore, the three-year span between third and sixth grades should give any growth in children's ability to comprehend the materials and the pictures a chance to appear.

HYPOTHESES

The focus of the present study was stated in two general questions. (1) To what extent can pictures carry a main idea message? (2) To what extent can content-relevant pictures reinforce or aid in the comprehension of the main idea of a paragraph? These questions were the result of the investigator's observations concerning the existing research of the effects of pictures upon reading comprehension and recommendations for further research by Vernon (1954) and Weintraub (1966a).

The first general question of this study was broadly conceived and considered, but the second general question was stated as the first working hypothesis, with the five other hypotheses necessitated by the inclusion of material and organismic variables. The direction of hypothesis reflects the investigator's interpretation of the existing research previously presented.

1. The addition of a content-relevant picture to written text enhances subjects' main idea responses.

2. Subjects who are directed to view a content-relevant picture before reading give better main idea responses than subjects not so directed.

3. Subjects who are told the purpose of a content-relevant picture and told to examine the

picture before reading give better main idea responses than subjects not told the purpose of the picture and subjects to whom the picture is not mentioned.

4. Main idea responses to paragraphs written as simply as possible, yet consistent with a main idea, are better than main idea responses given to paragraphs rated as appropriate for the subject's attained grade level, i.e., third or sixth.

5. Pictures have a greater effect upon boys' main idea responses than girls' main idea responses.

6. Sixth graders give better main idea responses than third graders.

II
METHOD

The subjects involved in this study were asked to state the main idea of each of three pictures, or of each of three paragraphs, or of each of three paragraphs when accompanied by a content relevant picture. Since the effect of direction to view a paragraph and a picture as an integrated presentation was also of concern, three different sets of instructions for subjects viewing paragraphs with pictures were used. Thus, the various reading conditions were content relevant pictures in isolation, paragraphs alone, paragraphs and pictures with no direction to view the picture, paragraphs and pictures with minimum direction to view the picture, and paragraphs and pictures with maximum direction to view the pictures. The other variables were readability of the paragraphs (basic and equal to the reader's grade placement), grade placement of the subject (third and sixth grades), and sex of the subject.

SUBJECTS

The sample comprised 240 subjects— 60 boys and 60 girls from third grade and like numbers from sixth grade. The subjects, who were selected at random from among the third and sixth grade students attending nine public elementary schools in Janesville, Wisconsin, met the following criteria: (a) they had never been enrolled in a special class, and (b) they had never repeated a grade.

The city of Janesville, with a population of approximately 34,000, is located in the extreme south-central portion of Wisconsin. Since the school district is not limited by the city boundaries, the nine schools which comprised the population of this study do not represent the whole Janesville district; rather, the schools sampled enrolled all the children living within the Janesville city limits and attending a public elementary school.

TREATMENT CONDITIONS

The various conditions of material and instruction which preceded the elicitation of a response to be rated as to its degree of similarity to a model main idea are described in this section. The common warmup task and the instruction peculiar to each of the five treatments are specifically discussed.

Warmup Task

As previously stated, the warmup task was the same for all subjects, irrespective of treatment. The objective of the warmup task was to help the subject become accustomed to responding in sentence form to the investigator. This was deemed essential since the response desired from the subject after he saw the experimental materials was a sentence.

The warmup task was merely a formalizing and standardizing of the initial contact between the investigator and the subject. The subject was greeted; the investigator stated his first name in a sentence; the subject was asked his name; this response was reinforced verbally; and then the investigator informed the subject that he (the investigator) had used a sentence to tell his name. At this time the investigator wrote the sentence, "My name is Karl," and asked the subject for a sentence of an identical nature containing the subject's name. The correct verbal response was copied by the investigator and reinforced verbally, after which the investigator showed the subject a second sentence, "My teacher's name is Mr. Brown." The subject was asked to state the name of his teacher in a sentence similar to the one before him, and the correct response was written down and reinforced verbally. Specific directions for the task were then introduced.

Warmup procedures, designated "Pretask," are given in Appendix A. Although the task may seem too easy for sixth-grade students,

this did not prove to be the case in pilot trials of preliminary drafts of the directions or in the final study.

Manipulation Of Materials And Directions

The five combinations of material format and direction to use it were as follows:

1. One group saw only the pictures (Pic). They were asked to "think about what the whole picture shows" and to "make up just one sentence in your own words that says what the whole picture tells you." Each subject saw three pictures in a preassigned randomized order. The instruction between pictures was a single sentence which restated the task. The picture was not taken away before the subject responded.

2 & 3. The group of subjects who saw only the three paragraphs (Text) and the group of subjects who saw the paragraphs with their appropriate content relevant pictures (PT nod) received the same directions. This meant that the PT nod group did not receive direction to view the picture. After the standard warmup task, the subjects in both groups were told to read the paragraph and "think about what all the sentences together say." The subjects were told to read silently and ask for help if they did not know any of the words. The material remained visible while the subjects responded. Since the subjects had three paragraphs to read, a standard task-directing sentence was used between paragraphs.

4. The fourth group of subjects saw the same pictures and paragraphs as PT nod, but minimum directions were given to view the picture carefully (PT min). As in the other conditions, the material was visible to the subjects until they answered, and the subjects received a sentence of direction between the paragraphs.

5. The fifth group saw the pictures and the paragraphs under conditions of maximum direction (PT max), which meant that the subjects were told that a picture was described by a paragraph. Furthermore, they were directed to study the picture in order to find out what the "whole picture" showed. Finally, they were directed to read a paragraph and state the main idea of the picture and the text. Procedures with regard to providing unknown words, removal of materials, and interjecting the standard sentences between the three tasks were the same as in the previous sets of directions.

In the directions to the subject (Appendix B) the term "main idea" was not used because it became clear during the piloting of the preliminary drafts that the third-grade students did not have a grasp of the meaning of the term. This may be the result (a) of a common format for exercises pertaining to the statement of a main idea where the student is asked to "give a name or title to the story" without any specific mention of the term "main idea," or (b) of formal teaching of the skill of reading to formulate the main idea or to find the topic sentence at Grades 4, 5, and 6.

Pilot studies also showed that statements such as "Tell me what the story is about" evoked summaries of the entire selection. The directions to the subject, therefore, included either one or both of the following statements: "Think about what the whole picture shows" and/or "Think about what all the sentences together say." Directions were then given to the subject to state a sentence in his own words concerning the material he saw.

Testing

The testing of the 240 subjects involved in the present study took place during the two week period from May 8 to May 19, 1967. One day was given to the testing of all the subjects enrolled in each of seven schools. Two other smaller schools which furnished fewer numbers of subjects were visited on a single day. All subjects were tested individually by the investigator in a small room in the school which they attended. Since the subjects had been screened as to exceptional class placement and failure to advance regularly, the only problem was to arrange for testing of those subjects who were absent on the day the investigator visited their school. It was possible to test all the absentees during the final two days of the two week testing period.

DESCRIPTION OF MATERIALS

The pictures, paragraphs, model main idea statements, and their assumed relationships are described in this section.

Pictures

The three 4" x 6" black and white ink drawings (Appendix C) were done by a professional illustrator with experience in illustrating educational materials. The illustrator was given copies of the main ideas and the paragraphs which had first-, third-, and sixth-grade ratings according to the readability formulae and was asked to draw several pictures illustrating each of the three main ideas. It was recommended that the information from each of the four sentences developed as specific

examples for a main idea be integrated into one picture. This was done for all sample pictures of the three main ideas. The illustrator and the investigator then chose a best picture for each main idea from the three or four available.

The picture illustrating the main idea "Animals help farmers in different ways" is picture A. Picture B illustrates "Birds build nests in different places." Picture C illustrates "Animals use claws for different things." They are presented in this order in Appendix C.

Paragraphs

The description of the paragraphs used in this study entails the description of the structure of the main ideas, their relationship to the paragraphs, and the structure of the paragraphs. The paragraphs are reproduced in Appendix C.

The structure of the main ideas. The three main idea statements which follow were developed in four-sentence paragraphs for Grades 1–6 by the personnel of the Laboratory for Research in Basic Skills, University of Wisconsin.

Each of the main ideas is six words in length and contains a class noun for the subject, a transitive verb, a direct object and a prepositional phrase of three words— preposition, adjective, and noun. The length and the structure of the main idea sentence were delimited (1) by the acceptance of T. L. Harris' model of a main idea,[1] and (2) by the content.

Harris reasoned that a model main idea sentence should include two elements: (1) a statement of the general topic covered, and (2) a restrictive statement derived from the specific content. Thus, each of the three main ideas comprise two main elements.

	General Topic	Specific Restriction
(A)	Animals help the farmer	in different ways.
(B)	Birds build nests	in different places.
(C)	Animals use claws	for different things.

Relationship of main idea to paragraph. The subject matter of the main ideas and tne four-sentence paragraphs were dictated in part by the words listed on the Stone list of 769 easy words (Stone, 1957), which is a revised vocabulary measure used in the Spache readability formula for primary grade material (Spache, 1953). This list provides some guidance regarding words known by first-grade children, and an attempt was made to write basal paragraphs at the first-grade level.

The following description of the formulation of a main idea of a paragraph further demonstrates the relationship of the content of the paragraph to the content of the main idea.

The formulation of the main idea of the paragraph can be viewed as a process of synthesizing four examples into one main idea or principle (Gagné, 1965). Figure 1 is a schematic representation of the operation of a reader within the framework of a first grade paragraph written to evoke Main Idea B (Appendix C). As shown in Figure 1, the reader synthesizes four referents to conceptualize portions of the first and second elements of the main idea and also recognizes the remaining words as those which appear in most of the sentences of the paragraph. Davis (1966, p. 254) specifically places synthesizing of class nouns (birds, animals) and relationships (different places, different ways) within the same type of concept learn-

[1] Unpublished paper entitled "Notes on Controlling the Ideational Structure of Paragraphs," 1965.

	General Topic			Specific Restriction	
Sentence	Synthesize	Recognize		Recognize	Synthesize
1	Robins	may build nests	/	under	a roof.
2	Bluejays	like nests	/	in	trees.
3	Ducks	make nests	/	in	tall grass.
4	Woodpeckers	make nests	/	inside wood fence posts.	
Main Idea	Birds	build nests make like	/	in	different places.

Fig. 1. The Cognitive Functions Used in Attaining the Concepts in a Main Idea

ing— categorizing. Assuming this to be true, the conclusion is that although the general topic may be hypothetically more important than the specific restriction of the paragraph, cognitively the two elements are formulated in similar ways.

Structure of the paragraphs. As previously mentioned, the three paragraphs developed for each of the three main ideas were four sentences long. This length was held constant even though within a set of three paragraphs carrying the same main idea the readability levels varied from the simplest form consistent with the main idea and sentence structure controls placed upon the material to a sixth-grade difficulty level. Besides the three basic paragraphs, one for each main idea, readability ratings showed one paragraph for each main idea to be at third-grade difficulty and one paragraph for each main idea to be at sixth-grade difficulty. The Spache readability formula (Spache, 1953; Stone, 1957) was used to rate the basic paragraphs and the third-grade paragraphs, but the Dale-Chall readability formula (Dale and Chall, 1948a, 1948b; Klare, 1952) was used to rate the sixth-grade paragraphs. The use of two formulae was necessary because no commonly used readability formula developed for use on educational materials can be used to judge both third- and sixth-grade material.

The difficulty level of the paragraphs was manipulated by increasing the length of the sentences and adding more words not appearing on the list of easy words associated with the formula. Complete readability information is given in Table 1, and the paragraphs are reproduced in Appendix C.

The three structural controls placed on the paragraphs, other than the selection of the topics from the Stone word list (1957), were those measured directly by readability formulae, i.e. vocabulary and sentence length, and one extra control, internal structure of sentences. The final control was decided upon by the staff of the Laboratory for Research in Basic Skills because some control of sentence structure was felt necessary and because it would facilitate description of the material. Since data were not available to support a progressive ordering of sentence complexity to coincide with the readability levels associated with Grades 1–6, an arbitrary manipulation of the number of phrases and clauses across grade levels was used. The manipulation shown in Table 2 was thought to (a) give sentence structure some of the developmental aspects of the vocabulary and sentence length variables which readability formulae measure and (b) clarify the placement of phrases and clauses in the materials used in this study (Table 3). The paragraphs used are

Table 1

Readability Data for all the Paragraphs According to Main Idea

Readability Factors	Main Idea A			Main Idea B			Main Idea C		
	Grades			Grades			Grades		
	1	3	6	1	3	6	1	3	6
No. of Sentences	4	4	4	4	4	4	4	4	4
No. of Words	25	50	63	25	50	63	25	50	63
$\bar{x}$ Sentence Length	6.5	12.5	15.75	6.25	12.5	15.75	6.25	12.5	15.75
No. of "Hard" Words[a]	1	5	5	2	5	5	1	5	5
Percentage "Hard" Words	4	10	7.9	8	10	7.9	4	10	7.9
Readability Scores[b]	2.1	3.5	5.69	2.4	3.5	5.69	2.1	3.5	5.69

[a] "Hard" words for paragraphs for Grades 1 and 3 are those not appearing on Stone's list (1957) which is used as the vocabulary control in the Spache formula. For the sixth-grade paragraphs "hard" words were those not on the Dale list, which serves as the vocabulary control for the Dale-Chall formula.

[b] Readability scores for paragraphs for Grades 1 and 6 are expressed in grades and are computed from the Spache formula. The readability scores for the sixth-grade paragraphs are Dale-Chall scores which place each paragraph in the upper 1/3 of the score range for Grades 4–6.

Table 2

The Number of Phrases and Clauses in Each Sentence of the Paragraphs, Grades 1–6

	GRADE					
Sentence	1	2	3	4	5	6
1	p[a]	p	p	pp	pp	pc[b]
2	p	p	pp	pp	pc	pc
3	p	pp	pp	pc	pc	pc
4	p	pp	pc	pc	pc	pc

[a] "p" denotes a prepositional, infinitive, gerund, or participial phrase.

[b] "c" denotes an adjective or adverb clause.

designated as for Grades 1, 3, and 6 in Tables 2 and 3. The following assumptions about the relative difficulty of prepositional phrases and subordinate clauses were the basis for the ordering. (a) A prepositional phrase does not add as much to the complexity of a sentence as a subordinate clause does. (b) A sentence with only one prepositional phrase is easier to read than a sentence with one clause or two prepositional phrases. (c) A two-phrase sentence is not as difficult to read as a sentence with a phrase and a clause, but is more difficult than a single-phrase sentence. (d) A sentence containing a phrase and a clause is more difficult to read than a sentence without a clause.

While Table 2 shows the relationship of phrase to clause as it was conceived, Table 3 shows the actual phrase-clause ordering within each sentence of the nine paragraphs used in this study.

DESIGN, SCORING, AND ANALYSIS

Design

Although it would seem that a single factorial design would encompass all variations of the major factors, there are several reasons for separate consideration of the data yielded by the subjects who saw pictures in isolation. (a) It was not the intent of the present study to compare the relative abilities of pictures and written materials to evoke main idea statements; rather, the intent was to investigate the possibility of differential effects on main idea statements made after the reading of written materials with content relevant pictures and written materials without pictures. (b) The focus concerning the pictures was upon the portion of the main idea that pictures evoked, and that could not be indicated by statistical techniques which are appropriately used in a factorial design. (c) Finally, the assumption of homogeneity of variance could not be met when the data from the pictures treatment was compared with the data from the other four reading conditions. The test used in this instance was Hartley's F Max Test (Winer, 1962, p. 92).

With the preceding rationale in mind, two factorial designs were incorporated into this study.

Table 3

Sentence Location of Phrases and Clauses in Paragraphs for Grades 1, 3, and 6 of Main Ideas A, B, and C

	Main Ideas								
	A			B			C		
	Grades			Grades			Grades		
Sentence	1	3	6	1	3	6	1	3	6
1	p[a]	pp	pc[b]	p	pp	pc	p	pc	pc
2	p	pp	pc	p	pc	pc	p	p	cp
3	p	p	cp	p	pp	pc	p	p	cp
4	p	pc	pc	p	p	cp	p	pp	pc

[a] "p" denotes phrase

[b] "c" denotes clause

A 4 x 2 x 2 x 2 completely crossed factorial design was used to check the hypotheses concerning (a) the effects of pictures and directions, i.e., text alone, pictures with text and no direction, pictures and text with minimal direction to view the picture, and pictures and text with maximal direction as to the relationship between pictures and the text; (b) the effects of readability levels of the material, i.e., basic or subject's grade placement; (c) the effects of the subject's grade placement, i.e., third or sixth grade; and (d) the effects of sex. Since six subjects of the same sex and grade placement were randomly assigned to each cell and there were 32 cells, a total of 192 subjects was used in this design. Each subject saw three pictures, or three paragraphs, or three paragraphs each with the appropriate content relevant picture. The order of presentation was randomized, but the readability and direction conditions were held constant across the three replications for each subject.

To find to what extent the pictures alone could carry the main idea message, the 144 responses of 12 boys and 12 girls from the third grade and like numbers from the sixth grade, i.e., 48 subjects, who saw only the picture were tabulated so that the kinds of main idea responses evoked by the pictures were apparent. A 3 x 2 x 2 factorial design with repeated measure of the first factor was employed to answer questions concerning the differential effects of the three pictures, grade placement, and sex on the main idea responses.

Scale

The 7-point scale which was used to rate the main idea responses in the present study was the fourth scale developed by the personnel of the Laboratory for Research in Basic Skills, University of Wisconsin. The first scale was basically hypothetical and preceded attempts to write materials with readability formulae difficulty ranging from first through sixth grade while holding the main idea constant. The other scales were developed after the material complexity was set and pilot studies were run. Three assumptions were reflected in the construction of the scales. (1) The optimal main idea statement is a sentence, not a topic or phrase. (2) The optimal main idea contains the general topic of the passage and the specific restrictions of the passage. (3) The general topic portion of the main idea statement is hypothetically more important than, but not operationally different from, the specific portion of the main idea statement.

The first main idea scale ranked main idea responses in terms of the elements of the main idea: (1) specific restriction; (2) general topic; (3) partially general-specific, i.e., both elements stated but not adequately or else not in proper relation to each other; or (4) fully general-specific, i.e., correct. In terms of a main idea used in the present study, "Birds build nests in different places," the specific restriction is the prepositional phrase "in different places," while the general topic is "birds build nests." Since it became clear during pilot studies that some children would not respond and some would give wrong answers, a second scale, shown in Figure 2, was developed. The terms "relevant" and "irrelevant" mean "correct" and "incorrect" in actual practice.

Category Description	Scale Value
No response	0
Irrelevant general topic and/or irrelevant specific restriction	1
Relevant specific restriction only	2
Relevant general topic only	3
Irrelevant general topic only	4
Relevant general topic and irrelevant specific restriction	5
Relevant general topic and relevant specific restriction	6

Fig. 2. The Second Main Idea Scale

The third scale was developed in response to the judges' feelings that the second scale was too elaborate. They had been scaling the responses of first graders for some time and had forgotten that older children gave more complex answers. The third scale did work on the first-grade responses, but was not important for that reason. It was important because in it the operational equivalence of the two elements of the main idea statement was recognized (Figure 3.)

Category Description	Scale Value
No response	0
No elements relevant	1
One element relevant	2
Both elements relevant	3

Fig. 3. The Third Main Idea Scale

The last scale to be developed prior to this study is shown in Figure 4. This scale was developed after the judges and the investigator tried out complete sets of materials and directions across six grade levels. It was then

Scale Value	Category Description
6	Both elements correctly stated.*
5	One element correctly stated, the other too generally or too specifically stated. e.g. Where birds like to build nests. How different animals help the farmer. How animals use their claws. What animals use their claws for. Robins, bluejays, ducks and woodpeckers build nests in different places. Horses, dogs, cats, and cows help the farmer in different ways. Lions, tigers, bears and cats use their claws for different things.
4	One element correctly stated. e.g. Animals what help the farmer on the farm. Animals put nests in different places. Animals use claws.
3	Irrelevant or incorrect material plus one element correctly stated OR one element correctly stated and the other too general or specific OR both elements correctly stated. e.g. How birds make nests. All the animals help the farmer in the summertime. How animals do and do not help the farmer. Where most birds build nests.
2	One or both elements too generally stated. e.g. Birds or Nests. Animals or Claws. About animals on a farm. About animals in the woods. Where birds live. Animals on the farm and what they do.
1	One or both elements too generally or specifically stated plus irrelevant or incorrect material OR one or both elements too specifically stated OR only irrelevant or incorrect material. e.g. Animals have sharp claws. Birds hide their nests. Re-read paragraph or a single sentence. How safe the farmer keeps the farm.
0	No response.

* Synonyms of the verb and of the adjective in the final prepositional phrase are acceptable.

Fig. 4. The Fourth Main Idea Scale and Example Responses

realized that the younger children, upon whose responses Scale 3 was based, had given more concise answers than were being noted as a result of the final set of directions and materials.

The more elaborate fourth main idea scale differed from the first two scales in that responses were not ranked according to which element of the main idea was mentioned, and it was similar to the third scale in that the main idea elements were operationally equated. Main idea responses were ranked on the fourth main idea scale by the degree of synthesizing within a main idea sentence. Optimal value was placed upon the complete main idea sentence; next were ranked sentences which did not contain all the synthesized material; then came general phrases or titles which children may be accustomed to make; and finally came incorrect main idea statements, garbled phrases, and nonsynthesized responses.

Scoring

The main idea responses were recorded by the investigator on specially constructed response sheets (Appendix D) which contained information as to the subject's name, grade, sex, treatment, and the pre-assigned randomized order of the three sets of materials.

The main idea responses were independently rated by three experienced judges. The investigator did not participate in the rating of the responses. All the main idea responses were coded, scrambled, and typed so that the judges could not know the treatment or have any information about the subject. The pages containing the responses were randomly ordered for each of the judges. At least two of the three judges gave the same rating to all but 25 of the 740 responses. This meant that two judges agreed on 96.7% of the main idea response ratings. The high interjudge agreement was important because that rating given by two or more judges was the rating assigned to the response and was the basis of the subject's score. The subject's score was the sum of the ratings given to his three main idea responses. It was possible for a subject's score across the three main ideas to range from 0–18, since each main idea rating ranged from 0–6. The 25 responses which did not receive a common rating were resubmitted to the judges for scaling. After the second independent scaling, three responses still had not received common ratings by two judges. These were discussed by the judges and a consensus was reached.

Analyses

A 4 x 2 x 2 x 2 analysis of variance (fixed model) was used to check the hypotheses concerning (1) the effects of pictures and directions, i.e., text alone, pictures with test and no direction, pictures and text with minimal direction to view the picture, and pictures and text with maximal direction as to the relationship between pictures and the text; (2) the effects of readability levels of the material, i.e., first grade or subject's attained grade; (3) the effects of grade placement, i.e., third or sixth grade; and (4) the effects of sex. There were six replicates of the basic design, i.e., 192 subjects. The score for each subject was the sum of the ratings given each of his three main idea responses. As previously mentioned, a main idea response was considered rated when two judges gave it the same scale value, and the rating then was that scale value.

To find to what extent the pictures alone could carry the main idea message, the 144 responses of the 48 subjects who saw only the picture were separated from the responses of the other 192 subjects. A 2 x 2 x 3 analysis of variance with repeated measure of the last factor (Pictures) was used. The other main effects were Grade and Sex. There were twelve response ratings per cell.

A method of post hoc analysis described by Winer (1962, pp. 85–89) and called by him the "Tukey (a) test" was used where significant effects were found. This test was chosen because Winer (p. 89) recommended it as applicable in a broad class of situations and as simple to apply. It was the present investigator's interpretation of Winer's statement, "In making tests on differences between all possible pairs of means it (Scheffe method) will yield too few significant results," (p. 89) that the Scheffe eliminated too many possibilities for the appearance of truly significant differences.

III

RESULTS AND DISCUSSION

The discussion of results comprises three sections: (1) the analyses of the main idea responses to the pictures only, (2) the analyses of the main idea responses to the reading conditions, and (3) consideration of the hypotheses stated in Chapter I in view of the data.

ANALYSES OF RESPONSES TO PICTURES

Scale ratings of the main idea responses given by subjects who saw only the picture are given in Table 4 for descriptive purposes. Each of the 48 subjects responded to all three pictures, so there are 48 rated main ideas for each picture. The responses are grouped at the lower end of the scale. Main ideas placed in Category 1 were either (a) too generally or specifically stated and contained irrelevant or incorrect material, (b) too specifically stated, or (c) incorrect or irrelevant. Inspection of the responses in Category 1 showed that the 119 responses comprised 36 incorrect responses; 36 overly general statements with extra material, e.g., birds in the spring; 35 overly specific responses with extra material, e.g., lion, tiger, bear, and cat are hungry; and 12 overly specific answers, e.g., lion, tigers, bears, and cats.

Table 4

Frequency of Main Idea Ratings for each Picture

	Scale Ratings						
Pictures	0	1	2	3	4	5	6
A	0	39	9	0	0	0	0
B	0	37	4	2	2	3	0
C	0	43	5	0	0	0	0
Total	0	119	18	2	2	3	0

Since the investigator was able to make discriminations among types of responses within Category 1, further refining of the scale, at least for responses to pictures, is necessary.

To determine the effect of specific pictures, grade, and sex upon the main idea responses, a repeated measures analysis of variance was run. The analysis is summarized in Table 5. The assumption of homogeneity of variance was confirmed with Hartley's F max test (Winer, 1962, p. 92). Comparisons of the largest and smallest variances were made within all main effects. None of the variance ratios were significant at the .05 level.

Table 5

Analysis of Variance of the Picture Response Ratings

Source	df	MS	F
Grades (G)	1	1.36	2.43
Sex (S)	1	.11	<1
G x S	1	.25	<1
Subj. w. groups error (between)	44	.56	
Pictures (P)	2	2.59	5.08*
G x P	2	2.09	4.10*
S x P	2	.26	<1
G x S x P	2	.06	<1
P x subj. w. groups error (within)	88	.51	

* $p < .05$

As shown in Table 5, there was no significant Grade or Sex effect, but the Pictures main effect and the Grade x Picture interaction were significant. Inspection of the means presented in Table 6 reveals that the responses evoked by Picture B differed from those evoked by Pictures A and C.

Table 6

Mean Main Idea Response Ratings for Subjects Viewing Pictures

Pictures			Grade		Sex	
A	B	C	Three	Six	Boys	Girls
1.19	1.54	1.10	1.18	1.38	1.25	1.31

The post hoc comparison of response rating means for the three pictures using the Tukey (a) test (Winer, 1962, p. 87), summarized in Table 7, revealed that the mean ratings of responses to pictures A and C did not differ significantly, but both differed from the mean of picture B. As shown in Table 4, the responses to B were rated as high as Category 5— one element correct plus the second element either too generally or specifically stated— which would account for the greater mean rating.

Table 7

Ordered Means and All Pair-Wise Gaps: Pictures Main Effect

Picture Means	Picture Means		
	C	A	B
	1.10	1.19	1.54
C-1.10	--	.09	.44*
A-1.19		--	.35*
B-1.54			--

* $p < .05$

The nature of the significant Grade x Picture interaction is clarified in Table 8, in which means are presented by Grade and by Picture.

Table 8

Mean Main Idea Ratings: Picture x Grade

	Pictures		
Grade	A	B	C
3	1.17	1.21	1.18
6	1.21	1.88	1.04

The sixth grade subjects who saw picture B have a higher mean response rating than any other group. The marked divergence of the sixth graders' responses to picture B is illustrated in Figure 5.

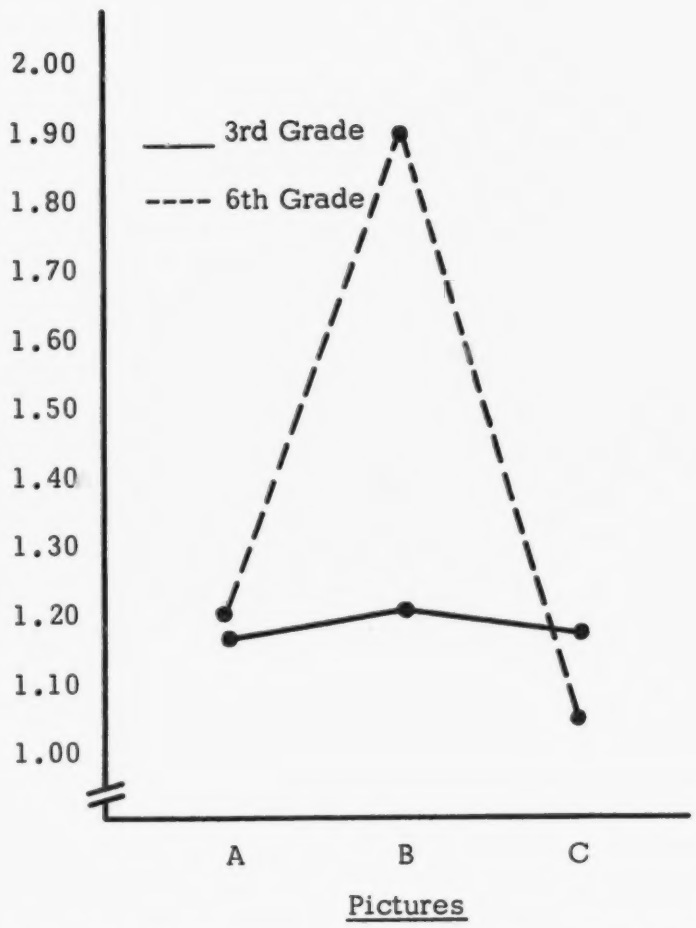


Fig. 5. Mean Main Idea Ratings Obtained from Three Pictures

The post hoc comparison of the six means using Tukey's test (Winer, 1962, p. 87), summarized in Table 9, confirmed the fact that the only mean significantly different from any other is that of the sixth-grade subjects who viewed picture B. Therefore, the significant main effect of Pictures, mentioned previously, is not irrespective of grade of subject, but is within Grade 6 only.

Table 9

Ordered Means and All Pair-Wise Gaps: Picture x Grade

Means	C-6	A-3	C-3	B-3	A-6	B-6
	1.04	1.17	1.18	1.21	1.21	1.88
1.04	----	.13	.14	.17	.17	.84*
1.17		----	.01	.04	.04	.71*
1.18			----	.03	.03	.70*
1.21				----	----	.69*
1.21						.69*
1.88						----

* $p < .05$

An inspection of the pictures in Appendix C showed that picture B's main idea, "Birds build nests in different places," is the only one illustrated through a differential placement of objects.

It could be said that the spacing meant something in picture B, but not in pictures A and C.

ANALYSIS OF RESPONSES TO TEXT

The main effects in the analysis of variance of the main idea responses of subjects who read the paragraphs were: reading conditions, readability levels, grades, and sex. The assumption of homogeneity of variance was confirmed with Hartley's F max test (Winer, 1962, p. 92). Comparisons were made within each main effect. None of the variance ratios approached significance at the .05 level.

The means of the main idea scores are given by major variable in Table 10. The analysis of variance, summarized in Table 11, revealed no significant differences among the reading conditions—i.e. (1) text without picture (Text), (2) picture with text but no direction to use the picture (PT nod), (3) picture with text and minimal direction to look at the picture (PT min), and (4) picture with text and direction as to the supposed relationship between picture and text (PT max). Sex, too, had no significant effect.

The readability levels and grade effects were significant at the .01 and .001 levels respectively. Since both effects contained but one pair of means a post hoc test was unnecessary. Inspection of Table 10 shows that the mean of the subjects who read first-grade level materials (Easy) is higher than the means of subjects who read materials at their grade level. Table 10 also shows that the mean of the sixth-grade subjects is higher than that of the third-grade subjects.

Two interactions were also significant: grade x sex ($p < .05$) and readability level x sex ($p > .05 < .10$). Inspection of the means

Table 10

Mean Main Idea Scores of 192 Subjects Reading Paragraphs

Reading Conditions			Readability		Grade		Sex	
Text	PTnod	PTmin	PTmax	Easy	Grade	Three	Six	Boys	Girls
9.96	10.83	9.48	9.71	10.91	9.08	8.66	11.33	9.95	10.04

Table 11

Analysis of Variance of the Main Idea Response Ratings

Source		df	MS	F
Reading Conditions	(RC)	3	16.84	1.12
Readability Levels	(RL)	1	159.51	10.60***
Grade	(G)	1	344.01	22.86****
Sex	(S)	1	.42	< 1
RC x RL		3	8.56	< 1
RC x G		3	8.56	< 1
RC x S		3	18.92	1.26
RL x G		1	45.05	2.99*
RL x S		1	11.51	< 1
G x S		1	81.38	5.41**
RC x RL x G		3	17.05	1.13
RC x RL x S		3	.23	< 1
RC x G x S		3	27.76	1.84
RL x G x S		1	4.05	< 1
RC x RL x G x S		3	16.98	1.13
Error Within		160	15.05	

* $p < .10$
** $p < .05$
*** $p < .01$
**** $p < .001$

of the main idea scores for grade x sex given in Table 12 reveals that the boys have the lowest mean (third grade) and the highest mean (sixth grade). The slopes plotted in Figure 6 serve to clarify the nature of the interaction.

Table 12

Mean Main Idea Ratings: Grade by Sex

	Sex	
Grade	Boys	Girls
3	7.96	9.35
6	11.94	10.73

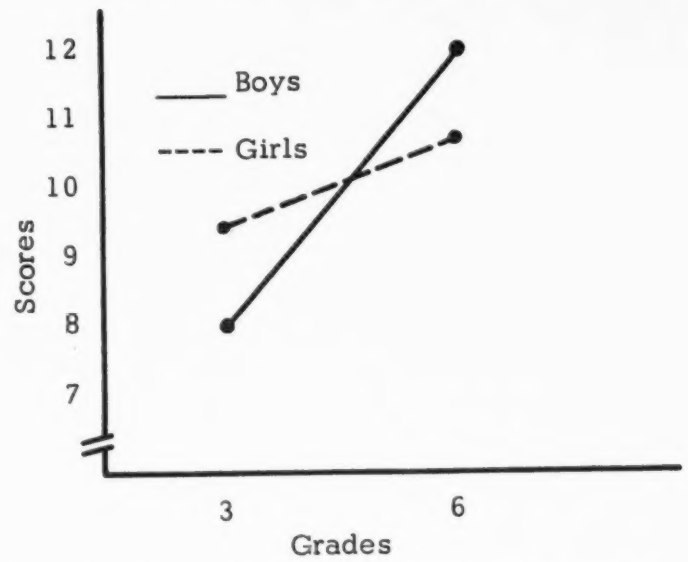


Fig. 6. Mean Main Idea Scores of Boys and Girls at Grades 3 and 6.

Post hoc comparisons of the relevant means by the Tukey (a) test, summarized in Table 13, show that the sixth-grade boys' mean is significantly different from both boys' and girls' means in third grade, but not different from that of the sixth-grade girls. The sixth-grade girls' mean is not different from the sixth-grade boys' or the third-grade girls' mean. Only the third-grade boys' mean differs significantly from that of the sixth-grade girls'.

The readability x grade interaction was felt to have practical significance because it aids in the interpretation of the significant readability levels effect. As mentioned previously, the materials considered under the treatment heading grade levels were not of equal difficulty, rather they were rated as at the attained grade of the subject— three or six. Furthermore, the relative difference between the readability levels of materials read within grade was not the same. A first-grade paragraph is easier to a sixth grader than a third grader; therefore, the differences between the means according to material read

Table 13

Ordered Means and All Pair-Wise Gaps; Grade x Sex Interaction

Means by Grade and Sex	Means by Grade & Sex			
	3-Boys 7.96	3-Girls 9.35	6-Girls 10.73	6-Boys 11.94
3-Boys 7.96	----	1.39	2.77*	3.98*
3-Girls 9.35		----	1.38	2.59*
6-Girls 10.73			----	1.21
6-Boys 11.94				----

* $p < .05$.

should be greater for sixth than third grade. Table 14, which contains the means of the third- and sixth-grade subjects according to readability of material, and Figure 7, which illustrates the differences, show this. Table 14 also shows that the sixth-grade subjects reading first-grade material have the highest mean and the only mean to differ significantly from any of the other three. Therefore, the sixth-grade subjects read the first-grade paragraphs significantly better than the at-grade-level paragraphs, but the third graders did not.

Table 14

Ordered Means and All Pair-Wise Gaps: Readability Levels x Grades Interaction

Means by Grade Readability	Means by Grade and Readability			
	3-Gr 8.23	3-Easy 9.08	6-Gr 9.94	6-Easy 12.73
3-Gr 8.23	----	.85	1.71	4.50*
3-Easy 9.08		----	.86	3.65*
6-Gr 9.94			----	2.79*
6-Easy 12.73				----

* $p < .05$

CONSIDERATION OF QUESTIONS AND HYPOTHESES

The results of the analyses are summarized in relation to the two questions and

GPO 809-282-5

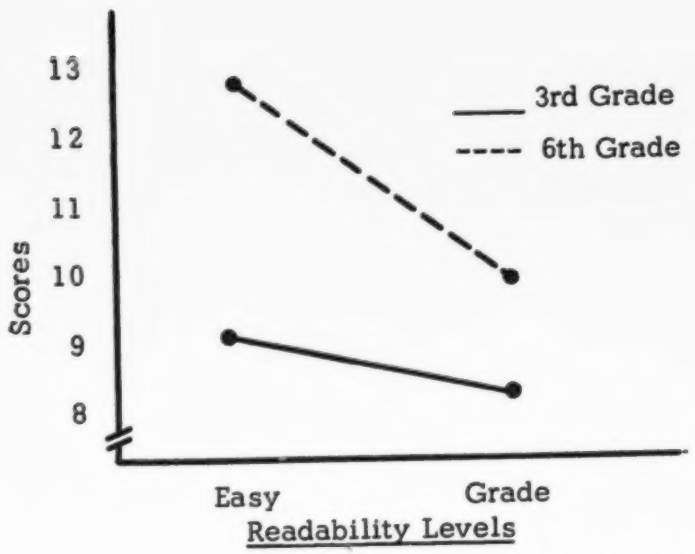


Fig. 7. Mean Main Idea Scores for Grades 3 and 6 with Paragraphs at Two Readability Levels

six hypotheses which served as the bases of the present study.

The first general question was, "To what extent can pictures carry a main idea message?" The answer to this question was sought by means of a tabulation by category of main idea responses of subjects viewing only the pictures. The responses to the pictures received generally low ratings as main ideas. In fact, 119 of 144 possible responses were rated as Category 1 (Table 4), which was defined as

One or both elements too generally or specifically stated plus irrelevant or incorrect material OR one or both elements too specifically stated OR only irrelevant or incorrect material.

e.g. Animals have sharp claws.
Birds hide their nests.
Re-read paragraph or a single sentence.
How safe the farmer keeps the farm.
(Fig. 4)

The second general question was, "To what extent can content relevant pictures reinforce or aid in the comprehension of the main idea of a paragraph?" The answer to this question, which was restated as the first of six working hypotheses, was sought by means of an analysis of variance of main idea response ratings. The analysis of variance is summarized in Table 11.

Hypothesis 1: The addition of a content relevant picture to written text enhances subjects' main idea responses.

The analysis of variance summarized in Table 11 shows that the Reading Conditions (RC) main effect was not significant. Since the only methodological difference between two of the four RC was the presence or absence of pictures, Hypothesis 1 is rejected within the limitations of the materials used in the present study.

Hypothesis 2: Subjects who are directed to view a content relevant picture before reading give better main idea responses than subjects not so directed.

As previously mentioned, the RC main effect was not significant. This means that the difference between the means of the groups with and without direction to view the picture was not significant. Hypothesis 2 is, therefore, rejected within the limitations of the study.

Hypothesis 3: Subjects who are told the purpose of a content relevant picture and told to examine it before reading give better main idea responses than subjects not told the purpose of the picture and subjects to whom the picture is not mentioned.

Hypothesis 3 is also rejected within the limitations of the materials used in the study because there was no significant RC main effect. That is, the only methodological difference among three RC was direction, and the mean of the group receiving the most thorough direction concerning the picture did not differ significantly from the means of the other two groups.

Hypothesis 4: Main idea responses to paragraphs written as simply as possible, yet consistent with the main idea, are better than main idea responses given to paragraphs rated as appropriate for the subject's attained grade level, i.e., third or sixth.

Hypothesis 4 is accepted conditionally because both the readability levels (RL) main effect and the RL x Grade interaction were significant (Table 11). The acceptability of the hypothesis is limited to sixth-grade subjects since the RL x Grade interaction and subsequent post hoc tests (Table 14, Fig. 7) show that only the responses of the sixth graders reading basic material were better than their counterparts who read grade level material.

Hypothesis 5: Pictures have a greater effect on boys' main idea responses than on girls' main idea responses.

Neither the analysis of variance of ratings of responses to pictures in isolation, summarized in Table 5, nor the analysis of variance of ratings of responses to paragraphs with content relevant pictures, summarized in Table 11, showed a significant Sex main effect. Therefore, Hypothesis 5 is rejected within the limitations of the materials used in the present study.

Hypothesis 6: Sixth graders give better main idea responses than third graders.

Both of the analyses of variance, i.e. of the picture response ratings and of the picture with paragraph response ratings, had a significant Grades main effect, but in both analyses a sig-

nificant interaction established limitations. The analysis of response ratings to pictures had a significant grade x picture interaction (Table 9) which showed that only the picture about birds elicited significantly better main idea responses from sixth graders than from third graders. The analysis of response ratings of paragraphs with pictures had a significant grade x sex interaction (Table 13) which showed that only the sixth-grade boys' mean response rating was significantly better than their third-grade counterparts.

Therefore, Hypothesis 6 is accepted with the following limitations: (a) when responding to pictures, sixth graders make better main idea statements to some pictures; and (b) when responding to pictures with paragraphs, sixth-grade boys respond better than third-grade boys. These statements are limited by the materials and the methodology used in the present study.

IV

SUMMARY, LIMITATIONS AND CONCLUSIONS, AND IMPLICATIONS

SUMMARY

This study was designed to investigate the effects of content relevant pictures upon the main idea responses of third- and sixth-grade students. The pictures were drawn to represent the main idea of the paragraphs, and the paragraphs were written within limits imposed by readability formulae.

Sixty boys and sixty girls from the third grades and like numbers from the sixth grades of the nine public elementary schools in Janesville, Wisconsin, were randomly chosen from among all pupils not in special classes.

In the following five treatments, to which subjects were randomly assigned by grade and sex, the subject was asked for the main idea carried by the materials: (1) after viewing a content relevant picture in isolation; (2) after reading a paragraph without any pictorial illustration of its main idea; (3) after reading a paragraph accompanied by an illustration of its main idea, but without directions to attend to the picture; (4) after reading a paragraph accompanied by an illustration of its main idea, with directions to attend to the picture; and (5) after reading a paragraph accompanied by an illustration of its main idea with directions to attend to the picture because it illustrated the main idea and was, therefore, an aid to comprehension of the main idea. One half of each of the boys and girls from Grades 3 and 6 within the four treatments using written materials (Treatments 2, 3, 4, 5) saw paragraphs rated at a first-grade difficulty level by the Spache formula while the other half of the subjects saw materials judged as at their attained grade level in difficulty by the Spache (Grade 3) or the Dale-Chall (Grade 6) readability formula.

Although the material varied as to form and readability level, only three main ideas were used, and all were seen in random order by every subject. Each main idea was developed in a picture and in a basic four-sentence paragraph plus paragraphs written at third- and sixth-grade difficulty levels. The pictures were 4" x 6" black and white drawings judged by the investigator and the artist as the best of several illustrations of each main idea done by the artist. Operationally, each main idea statement in this study has two elements—a general topic and a specific restriction—and requires the same type of conceptualizing in both elements.

All subjects were tested individually in their respective schools by the investigator. The directions and warmup task were standard for all subjects. Responses were recorded verbatim, randomized, and rated by three experienced judges who used a 7-point scale.

The following analyses were performed: (a) The frequency of responses to the pictures in isolation was tabulated within each category on the scale. (b) The scale values of the three main idea responses from each of 48 subjects viewing the pictures alone were submitted to a $2 \times 2 \times 3$—sex, grade, pictures—repeated measures analysis of variance. (c) The sum of the three main idea ratings for each of the 192 subjects reading the text with or without pictures was submitted to a $4 \times 2 \times 2 \times 2$—reading conditions, readability level, grade, and sex—analysis of variance.

The salient results of the analyses can be briefly summarized. (1) The tabulation of responses to pictures in isolation showed that the responses had generally received low ratings on the main idea response scale. (2) The analysis of variance of the main idea responses to pictures in isolation showed that generally there were no significant differences between the responses of boys and girls and of subjects in Grades 3 and 6. Responses to one picture were better than responses to the other two, but only for sixth-grade subjects. (3) The analysis of variance of the responses to the paragraphs with or without pictures and directions showed that the addition of the pictures

and directions did not affect the adequacy of the main idea responses. Although both readability and grade effects were significant, on the basis of post hoc analyses it was suggested that reading easy materials led to significantly better main idea responses only among the sixth graders and that the boys alone accounted for the difference. In fact, there were no significant differences between the responses of girls in third and sixth grades or between the responses of boys and girls within each grade.

LIMITATIONS AND CONCLUSIONS

The generality of the conclusions is limited by the following factors. (1) The paragraphs are short, expository in style, specifically controlled as to the number of words, sentences, and referents to the class nouns in the main idea sentence, and specifically controlled as to the vocabulary level, content, and gross readability score. (2) The pictures were drawn to illustrate the main idea of a paragraph. (3) The structure of the main idea sentence and the scale used to judge it are specific to the study. (4) The main idea is not explicitly stated in the paragraphs; therefore, the results are not applicable to paragraphs with explicitly stated main ideas. (5) Subjects' reading level was not controlled, so no comparisons can be made to specific segments of the population as defined by reading level. (6) Only third and sixth grades were sampled. (7) The sample is from a Midwestern city of 35,000 which is not known to contain the extreme socioeconomic groupings.

The results of the analyses warrant the following tentative conclusions:

1. Pictorial representations of a main idea do not necessarily evoke adequate main idea responses.
2. The addition to an expository paragraph of a content relevant picture similar to those used in this study does not enhance the scale ratings of elicited main idea responses. Furthermore, directions to use the picture as an aid to comprehension of the main idea do not enhance the scale ratings of the main idea responses evoked.
3. In general, responses evoked by pictures are not affected by the sex or grade placement of the subject, but sixth graders' responses evoked by a picture expressing the main idea through the placement objects were better than (a) third graders' responses irrespective of picture and (b) sixth graders' responses to the other two pictures.
4. When the pictures used for this study were presented alone, very low order attempts at stating a main idea were evoked. In view of this fact, and the defensible expectation that content relevant pictures and directions to peruse them ought to enhance performance, an inescapable conclusion is that perhaps the inadequacy of the pictures was responsible for the present negative results. If illustrations capable of evoking higher order main idea statements had been devised, quite different results might have been obtained.
5. Although some investigations of the role of pictures in reading comprehension have shown sex differences favoring boys, the present data showed no significant differences between the responses of boys and girls within the same grade.
6. Within the limitations of the expository style and brevity of the paragraphs used in this study, varying the readability level of the paragraphs from that equal to the reader's attained grade to that designated here as appropriate for a first-grade student enhances the main idea statements of sixth-grade students, but not third-grade students.
7. Further elaboration of the main idea scale, particularly among the lower valued categories, seems to be essential because further classification of low level responses was necessary.

IMPLICATIONS

Implication For Instruction

The failure of the pictures in this study to aid in the comprehension of the main idea implies that pictures in textbooks should not be expected to aid to any great extent in the comprehension of a main idea of a paragraph. The preceding statement is made because it seems illogical to expect textbook pictures, which may be drawn for many other reasons, to be aids in comprehension of a main idea when pictures drawn to represent a main idea cannot affect comprehension. The fact that pictures do serve other purposes is seen in Vernon's (1954) finding that specific facts pictorially represented were recalled relatively more times than those facts not pictorially represented. Furthermore, Whipple (1953), among others, has found that pictures increase the interest appeal of the book, and, in general, teachers use pictures to introduce stories and new words.

Implications For Research

Implications for further research can be found with regard to subjects and the nature and evaluation of the main idea responses.

A need for investigation of the picture and comprehension relationship among poor readers can be said to exist because there are no studies in the area upon which to base conclusions. There are two studies in the literature which deal with the poor reader (Halbert, 1943; Weintraub, 1960) and the picture and reading comprehension relationship, but both must be viewed within limitations. Among other things, Halbert used a sample of impoverished Kentucky hill people, and Weintraub used the lowest 10% of a superior-achieving group of second graders as his poor reader sample. Another reason for instigating research on poor readers is that the materials in most previous studies have not been so difficult that a reader was forced to seek outside help. Only Vernon (1954) noted informally that she had chosen materials which were too hard for some students, and she did not develop this area of investigation.

The material used in the study was expository, short, well-structured, and did not contain a stated main idea. Since these are not the characteristics of all textbooks and basal readers that third- and sixth-grade children read, investigation of the effects of pictures upon the comprehension of the main idea of long, rambling, narrative material with stated main ideas might yield significantly different findings.

The pictures used in the present study were conventional black-and-white drawings meant to illustrate and therefore reinforce what was in the written passage. These very limitations should be studied. There are no studies available at this time which focus on the relationship of color to comprehension or on the role of conventionality of size or format of the illustration to comprehension. It can be speculated that color will influence the extraction of a specific fact from a picture and hence increase the likelihood of its being understood in the text, but the possible relationship of color to the main idea is not so clear. Furthermore, it is possible that pictures which represent a portion of the main idea or other relationship among the sentences of a paragraph would be of value. Certainly, it is evident that comic strips can carry messages without verbal materials, but the effects of a similar format on reading comprehension is not a matter of record.

Even though the main ideas used in the present study are of similar construction, it was discovered that the illustrations are different. One picture which carried a main idea message through the spacing of objects was found. Since this proved to be the best stimulus, further development and testing of main ideas or principles which can be expressed through the placement of the objects in a picture seems justified. The pictures from the present study might be redrawn to maximize the spacing of the objects in an attempt to evoke responses which would receive higher scale ratings. If this were possible, the suggestion that pictures evoking higher order main ideas might be the key to the successful use of pictures as aids to comprehension of the main idea could be investigated.

The response mode in the present study was not the common multiple-choice form; instead, personally formulated statements were required. Since a rather exhaustive search of the literature produced only one study (Vernon, 1962) of the multiple-choice and essay examination relationship, it was concluded that a lack of empirical data about the relationship of the response formats exists. Also there is no work with elementary or secondary school children, since Vernon used college students. If stating a main idea is not the same thing as recognizing it in a multiple-choice examination, and stating a main idea is more like an independent study task, then no reading achievement examination tests a skill which is probably more like that used in independent studying. Support for this position can be found in Thomas C. Barrett's incorporation of reading comprehension skills into a cognitive function hierarchy.[2] He presented recognition and formulation of main ideas as different skills.

Since further classification of responses evoked by the pictures was necessary, a scale was constructed which makes finer discriminations among responses possible (Figure 8). The scale, which has twelve categories instead of seven, also does not make a judgment as to the relative values of overgeneralizing or becoming too specific. It is suggested that this scale may be of value in further investigations of the characteristics of main idea responses elicited from various populations of readers under varying conditions of material and direction.

---

[2]Unpublished paper entitled "Taxonomy of Cognitive and Affective Dimensions of Reading Comprehension," 1966.

Category Description	Value
No response.	0
Irrelevant or incorrect material.	1
One element too generally or specifically stated plus irrelevant or incorrect data.	2
One element too generally or specifically stated.	3
Two elements too generally or specifically stated plus incorrect or irrelevant material.	4
Two elements too generally or specifically stated.	5
One element correctly stated plus irrelevant or incorrect data.	6
One element correctly stated.	7
One element correctly stated plus one element too generally or specifically stated plus irrelevant or incorrect data.	8
One element correctly stated plus one element too generally or specifically stated.	9
Two elements correctly stated plus irrelevant or incorrect data.	10
Two elements correctly stated.	11

Fig. 8. The Fifth Main Idea Scale

APPENDIX A
PRETASK

DIRECTIONS

Hello, there. My name is _____. What's your name? Good. _____, did you notice that I used a sentence to tell you my name? READ AND FILL IN NAME. You said your name was _____. Can you make up a sentence just like mine to tell me your name? Good. I have your sentence written here too. READ AND FILL IN NAME. Suppose I say, "My teacher's name is Mr. Brown." SHOW SENTENCE AS YOU SAY IT. Can you make up a sentence like mine to tell me your teacher's name? Very good. I'll write that down in here. WRITE NAME IN. Now we have four sentences to read. Will you read each one back to me?

RESPONSE SHEETS

My name is .

My name is .

My teacher's name is Mr. Brown.

My teacher's name is

APPENDIX B
DIRECTIONS

PICTURE

Very good. Now we're going to do something a little different. I have some pictures for you to look at. As you look at each one think about what the whole picture says. When you finish looking, make up just one sentence in your own words that says what the whole picture tells you. GIVE MATERIALS TO S.

— S LOOKS AT PICTURE—

What does this whole picture tell you? You may look back at the page if you wish. IF NO RESPONSE IN 10 SECONDS, REPEAT QUESTION. Now let's do the same thing on another page. Would you look at this and think about what the whole picture says?

PT Nod

Very good. Now I have some more sentences for you to read, but we're going to do something a little different. This time, as you read, think about what all the sentences together say. When you finish reading, make up just one sentence in your own words that says what all the sentences tell you. You can read this silently — to yourself. If you do not know any of the words, ask me and I will tell you. GIVE MATERIALS.

— S READS MATERIAL—

What do all of these sentences together tell you? You may look back at the page if you wish. IF NO RESPONSE IN 10 SECONDS, REPEAT. Now let's do the same thing on another page. Would you read this and think about what all the sentences say? GIVE MATERIALS.

PT Min

Very good. Now I have some more sentences for you to read, but we're going to do something a little different. This time, before you read, look carefully at the picture. Then, as you read, think about what all the sentences together say. When you finish reading, make up just one sentence in your own words that says what all the sentences tell you. You can read this silently — to yourself. If you do not know any of the words, ask me and I will tell you. GIVE MATERIALS.

— S READS MATERIAL—

What do all of these sentences together tell you? You may look back at the page if you wish. IF NO RESPONSE IN 10 SECONDS, REPEAT. Now let's do the same thing on another page. Would you look at the picture, then read this and think about what all the sentences say?

PT Max

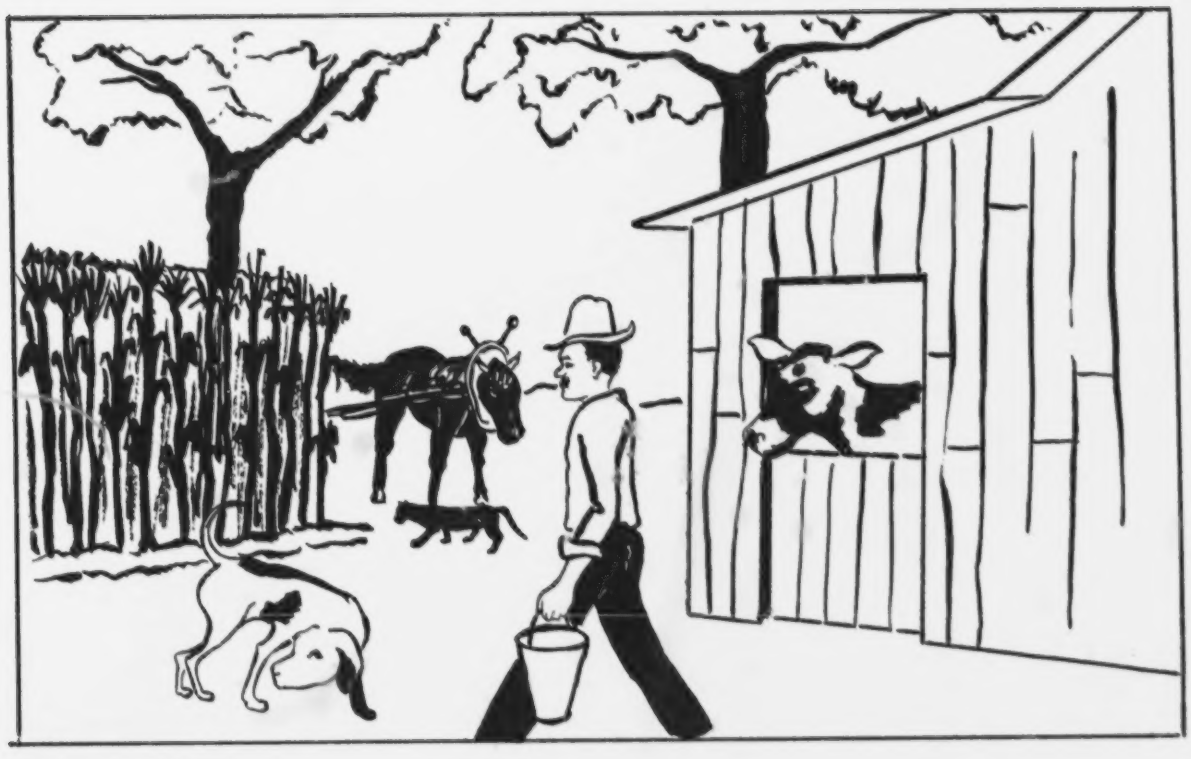
Very good. Now we're going to do something a little different, I have some pictures with sentences that tell about them. Before you read, look at the picture and think what the whole picture shows. Then, as you read, think about what all the sentences together say. When you finish reading make up just one sentence in your own words that says what the whole picture and all the sentences together say. You can read this silently — to yourself. If you do not know any of the words, ask me and I will tell you. GIVE MATERIALS.

— S READS MATERIAL —

What does all this together tell you? You may look back at the page if you wish. IF NO RESPONSE IN 10 SECONDS, REPEAT. Now let's do the same thing on another page. Would you look at the picture, think what it all says, and then read and think about what all the sentences say?

GPO 809-282-4

APPENDIX C
MATERIALS



PICTURE A

Horses help farmers to work. Cats keep farmers' corn safe from mice. Cows help farmers by giving milk. Dogs help farmers to watch the barnyard.

Horses help the farmers to plow their wheat and corn fields in the spring-time. Cats help the farmers to keep their corn safe from greedy and hungry mice. Cows give milk to the farmer and his large family. Dogs help farmers by guarding the whole barnyard when it is night.

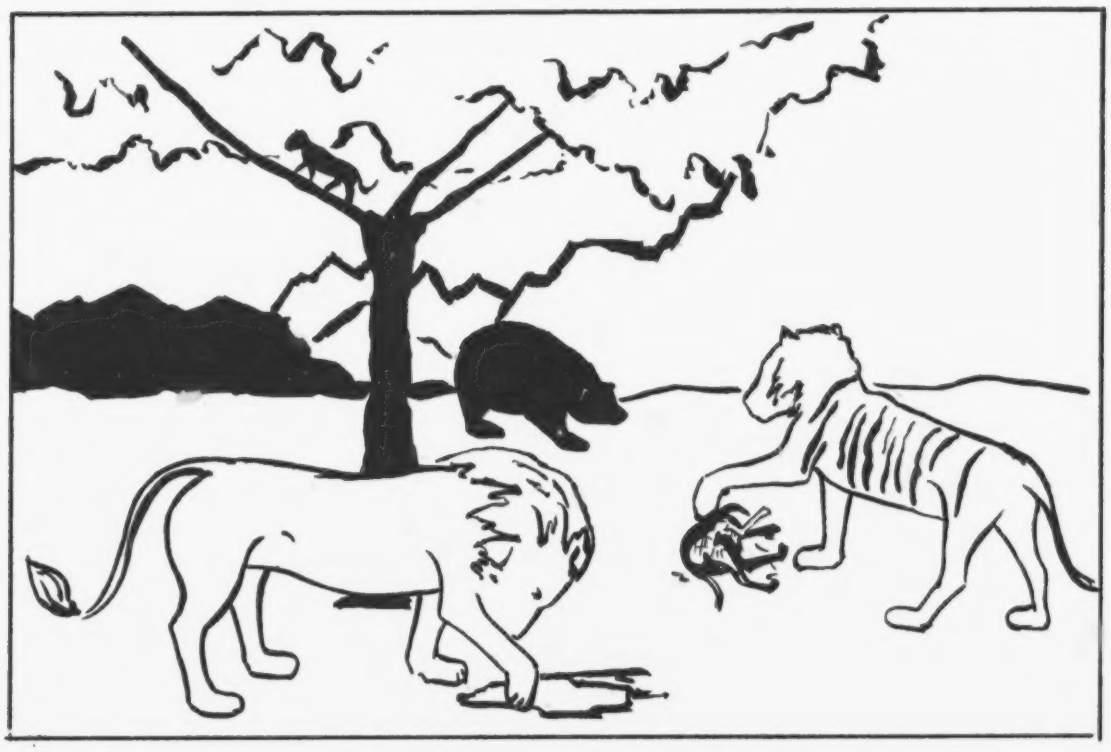
Horses help farmers to plow their wheat and corn fields when spring comes. Cats help the farmers to keep their valuable corn safe whenever greedy, hungry mice try stealing the grain. Cows give very tasty milk when the farmer and his large family of six need it. Dogs help the farmers by guarding the entire barnyard particularly carefully when the people are asleep.

PICTURE B

Robins may build nests under a roof. Bluejays like nests in trees. Ducks make nests in tall grass. Woodpeckers make nests inside wood fence posts.

Robins build their nests under the roofs of houses and barns. Bluejays like nests in trees that have many big branches. Ducks, however, carefully make their nests in the wild rice, high weeds, or tall marsh grass near other duck nests. Woodpeckers sometimes make nests inside old wood fence posts.

Robins build their nests under house and barn roofs where they overhang the building. Bluejays like nests in leafy trees that have big branches. Ducks, however, carefully make nests in wild rice, high weeds, or tall marsh grass that may contain many duck and other wildlife homes. Woodpeckers sometimes make nests that are quite soft and comfortable inside old wooden fence posts.



PICTURE C

Lions use claws to hold their food. Bears have claws for digging. Cats' claws help them to climb trees. Tigers use strong claws for killing.

Lions use their claws to hold the food that they are eating. Bears have long claws for digging up many different roots and insects. Cats' claws help them to climb the most difficult trees in a hurry. Tigers use their strong claws for fighting their many enemies in the woods.

Lions use their claws to grasp the food that they have just caught. Bears have very long claws that help them to dig up and tear apart various roots and insects. Cats' claws help them if they are forced to climb even the most challenging trees very quickly. Tigers use their strong, powerful claws to fight their jungle enemies whom they frequently attack.

APPENDIX D
RESPONSE SHEET

Name _____ Examiner _____

School _____ Task _____

Grade _____

Sex _____

If S gives a subject referent that is not clear (they, some, etc.) point to the word in the written sentence (e.g. "they") and ask: "What do you mean by 'they'?"

Task _____

"What do you mean by 'they'?"

Task _____

GPO 809-282-3

REFERENCES

Broening, A. M. Abilities which contribute to effective reading. Education, 1941, 62, 11–17.

Burdick, J. G. A study of cross-section drawings as technical illustrations in high school science textbooks. Unpublished doctoral dissertation, Syracuse University, 1959.

Dale, E., & Chall, J. S. A formula for predicting readability. Educational Research Bulletin, 1948, 27, 11–20. (a)

Dale, E., & Chall, J. S. A formula for predicting readability: Instructions, Educational Research Bulletin, 1948, 27, 37–54. (b)

Davis, F. B. Fundamental factors of comprehension in reading. Psychometrika, 1944, 9, 185–197.

Davis, G. A. A note on two basic forms of concepts and concept learning. Journal of Psychology, 1966, 62, 249–254.

Davis, O. L., Hicks, L. C., & Bowers, N. D. The usefulness of time lines in learning chronological relationships in text materials. The Journal of Experimental Education, 1966, 3, 22–25.

Davis, O. L., & Slobodian, J. J. Teacher behavior toward boys and girls during first grade reading instruction. American Educational Research Journal, 1967, 4, 261–269.

Gagne, R. M. The conditions of learning. New York: Holt, Rinehart and Winston, 1965.

Goodykoontz, B. The relation of pictures to reading comprehension. Elementary English Review, 1936, 13, 125–130.

Gray, W. S. Reading. In C. W. Harris (Ed.) Encyclopedia of Educational Research. New York: Macmillan, 1960. Pp. 1086–1135.

Halbert, M. An experimental study of children's understanding of instructional materials. Bulletin of School Service, 1943, 15(4), 7–60.

Harris, A. J. How to increase reading ability. New York: David McKay, 1961.

Kambly, P. E. Science textbook illustrations. Science Education, 1943, 27, 17–19.

Klare, G. R. A table for rapid determination of Dale-Chall readability scores. Educational Research Bulletin, 1952, 31, 43–47.

Lewernz, A. S. Some results of a visual education class in junior high school social studies taught with the aid of flat pictures. Educational Research Bulletin, 1929, 8, 4–16.

Miller, W. A. Reading with and without pictures. Elementary School Journal, 1938, 39, 676–682.

Russell, D. H. Children learn to read. Boston: Ginn, 1961.

Spache, G. A new readability formula for primary-grade reading materials. Elementary School Journal, 1953, 53, 410–413.

Spaulding, S. Research on pictorial illustration. Audio-Visual Communication Review, 1955, 3, 35–45.

Stone, C. R. Measuring difficulty of primary reading material: a constructive criticism of Spache's measure. Elementary School Journal, 1957, 57, 36–41.

Strang, A. M. A study of gains and losses in concepts as indicated by pupils' reading scores after the addition of illustrations to the reading matter. Unpublished doctoral dissertation, Temple University, 1941.

Vandermeer, A. W. Relative contributions to factual learning of the pictorial and verbal elements of a filmstrip. The School Review, 1950, 58, 84–89.

Vernon, M. D. The value of pictorial illustration. British Journal of Educational Psychology, 1953, 23, 180–187.

Vernon, M. D. The instruction of children by pictorial illustration. British Journal of Educational Psychology, 1954, 24, 171–179.

Vernon, P. E. The determinants of reading comprehension. Educational and Psychological Measurement, 1962, 22, 269–286.

Weintraub, S. A. The effect of pictures on the comprehension of a second grade basal reader. Unpublished doctoral dissertation, University of Illinois, 1960.

Weintraub, S. A. Illustrations for beginning reading. Reading Teacher, 1966, 20, 61–67. (a)

Weintraub, S. A. Sex differences in reading achievement. Reading Teacher, 1966, 20, 155–165. (b)

Whipple, G. Appraisal of the interest appeal of illustrations. Elementary School Journal, 1953, 53, 262–269.

Winer, B. J. Statistical principles in experimental design. New York: McGraw-Hill, 1962.

GPO 809-282-2